

# MB4U

BiSS, SSI, PC-USB 2.0 ADAPTER

preliminary



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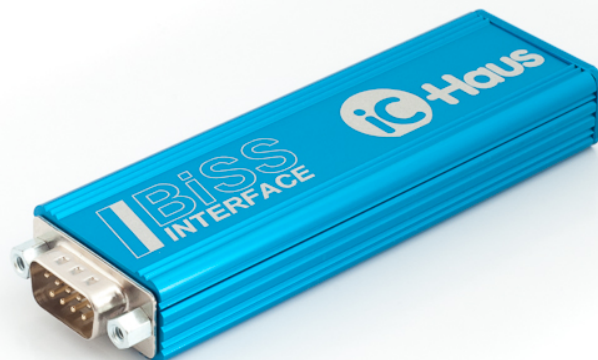
## FEATURES

- ◆ USB 2.0 high speed PC interface
- ◆ FPGA based logic
- ◆ Hardware implemented interface protocols
- ◆ Fast realtime data communication (10 MHz BiSS; 4 MHz SSI)
- ◆ API for Windows®: BiSS-Interface DLL
- ◆ Field capable design: anodized aluminium case, field interface, USB providing power
- ◆ USB powered 5 V and 12 V supplies for external applications
- ◆ Supported interface and protocols: BiSS C / BiSS B / SSI

## APPLICATIONS

- ◆ BiSS / BiSS Safety / SSI application development
- ◆ BiSS / SSI debugging
- ◆ Flexible interface configuration
- ◆ Encoder calibration
- ◆ Portable applications

## SYSTEM VIEW



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### DESCRIPTION

The MB4U adapters are USB based Windows® PC adapters with PC-USB 2.0 high speed interface and FPGA logic system based BiSS master.

The BiSS to PC-USB adapters enable to connect BiSS or SSI sensors to a PC easily and at low cost. Multiple MB4U BiSS to PC-USB adapters are accessible per PC system. The USB port supplies the adapter as well as the connected sensor. The supply voltages VB and VDD are galvanically coupled to the USB. The BiSS/SSI communication is accomplished by differential RS422 wires with separate potentials and cycle rates of up to 10 Mbit/sec.

#### BiSS Interface Functions and Features:

- Up to 8 BiSS slaves
- RS422 10 MBit/s maximum data transfer rate
- BiSS C, BiSS C unidirectional and BiSS B master
- SSI master
- USB 2.0 interface up to 30 MBit/s data transfer
- USB interface compatibility to 12 MBit/s data transfer
- Multiple adapter per PC system supported
- Adapter and devices can be supplied from the USB port, galvanically coupled
- VB and VDD are available with allocating the adapter via API or software
- VB and VDD are disabled with de-allocating the adapter via API or software
- BiSS and SSI master are iP MB100 based
- FPGA integrated 1st level RAM
- Time based SCD cycle trigger capable
- Available 32 and 64 bit drivers for Windows®10, 8, 7, Vista, XP, 2000

The device offered here is a multifunctional device that contains integrated BiSS C interface components. The BiSS C process is protected by patent DE 10310622 B4 owned by iC-Haus GmbH. Users benefit from the open BiSS C protocol with a free license which is necessary when using the BiSS C protocol in conjunction with this iC.

Download the license at [www.biss-interface.com/BUA](http://www.biss-interface.com/BUA)

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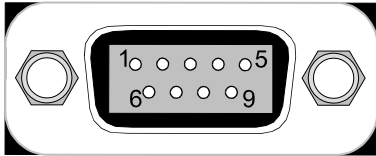
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## CONNECTORS

### PIN CONFIGURATION BiSS

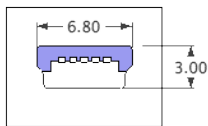


### PIN FUNCTIONS

#### No. Name Function

1	VB	Field power supply
2	MA+	Clock output P
3	MA-	Clock output N
4	VDD	Logic power supply
5	MO-	Master data output N
6	GND	Ground (0 V)
7	SL+	Device data input P
8	SL-	Device data input N
9	MO+	Master data output P

### PIN CONFIGURATION Mini USB



### PIN FUNCTIONS

#### No. Name Function

1	VCC	5 V USB supply
2	D-	Data -
3	D+	Data +
4	ID	Identifier: A = GND, B n.c.
5	GND	Ground (0 V)

### PIN CONFIGURATION MU1C cable, sensor side J2



### PIN FUNCTIONS

#### No. Name Function

1	VDD	Logic power supply (5 V)
2	GND	Ground (0 V)
3	SLO+	Device data output P
4	SLO-	Device data output N
5	MA+	Master clock input P
6	MA-	Master clock input N

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## ABSOLUTE MAXIMUM RATINGS

Beyond these values damage may occur; device operation is not guaranteed.

Item No.	Symbol	Parameter	Conditions	Min.   Max.		Unit
				Min.	Max.	
G001	Power USB	Maximum Power Consumption from USB Bus	see USB specifications		500	mA
G002	VDD	Logic Power Supply		4.0	5.5	V
G003	I(VDD)	Logic Power Supply	$VDD \geq 4.5V, I(VB) = 0mA$	250	350	mA
G004	VB	Field Power Supply		9	13	V
G005	I(VB)	Field Power Supply	$VB \geq 9V, I(VDD) = 0mA$	90	125	mA
G006	PIN1	VB	No reverse supply permitted	-0.3	13	V
G007	PIN4	VDD	No reverse supply permitted	-0.3	5,8	V
G008	PIN7, PIN8	RS422 input pins		-0.3	5,8	V
G009	V(PIN6 to USB)		GND USB = GND FIELD	0	0	V

## THERMAL DATA

Item No.	Symbol	Parameter	Conditions	Min.   Typ.   Max.			Unit
				Min.	Typ.	Max.	
T01	Temp	Temperature Range		0		50	°C
T02	HUM	Humidity	non condensing	5		95	%

All voltages are referenced to ground unless otherwise stated.

All currents flowing into the device pins are positive; all currents flowing out of the device pins are negative.

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### ELECTRICAL CHARACTERISTICS

Item No.	Symbol	Parameter	Conditions				Unit
				Min.	Typ.	Max.	
<b>Power Supply Input</b>							
001	Vusb	Supply Voltage	By USB port	4.5	5.0	5.5	V
002	Iusb	Current Consumption	From USB port			500	mA
<b>Power Supply Output (VDD, VB)</b>							
101	VDD	VDD Supply Output	USB powered	4.5	5.0	5.5	V
102	I(VDD)	Permissible VDD Load Current	USB powered; load at VDD; no other load at VB, MA±, MO±			250	mA
103	VB	VB Supply Output	USB powered	9	12	13	V
104	I(VB)	Permissible VB Load Current	USB powered; load at VB; no other load at VDD, MA±, MO±			90	mA
<b>RS-422 Outputs MA/NMA/MO/NMO</b>							
301	Vout()	Diff. Output at MA+, MA-, MO+, MO-	RL = 54Ω; according to MAX3491EESD+ or ADM3491 datasheet	1.5			V
302	fclock()	Clock Frequency at MA+, MA-	50% duty cycle		10		MHz
303	fdata()	Data Frequency at MO+, MO-	50% duty cycle		10		MHz
<b>RS-422 Inputs SL/NSL</b>							
401	f(max)	Maximum Communication Frequency	50% duty cycle			10	MHz
402	VIT(+)	Positive going input threshold voltage at SL+ vs. SL-	according to MAX3491EESD+ or ADM3491 datasheet			0.8	V
403	VIT(-)	Positive going input threshold voltage at SL+ vs. SL-	according to MAX3491EESD+ or ADM3491 datasheet	2.0			V
404	VHYST	Hysteresis voltage	according to MAX3491EESD+ or ADM3491 datasheet		50		mV
405	Rin()	Input Termination at SL+ vs. SL-			120		Ω

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## GALVANIC COUPLING OF USB, POWER SUPPLY, GND, SIGNALS AND SHIELD

The MB4U provides VB, VDD, GND, Shield and the BiSS signals MA+, MA-, MO+, MO-, SL+ and SL- with galvanic coupling to the USB interface. Before connecting sensors or cable adapter to the MB4U the system GND and shielding potential needs to be identical with

the adapter GND and adapter shield to prevent ground loops and potential differences.

MB4U is galvanically coupled. A common GND potential and shield potential is mandatory. If a galvanic isolation is required, the signals and supply path needs to be de-coupled by 3rd party devices/isolators.

## BiSS POWER SUPPLY CONTROL

The MB4U supplies VB and VDD voltages with allocating and initializing the adapter. With de-allocating the adapter resource or the software the voltages VB and VDD are turned off to permit a safe unplugging of connected devices.

The un-powering of VB and VDD requires a non volatile device content storing before closing the interface adapter in any software environment.

MB4U may not be supplied into VB nor VDD. If the sensor needs to be supplied by 3rd power supply, the GND needs to be identical and any backwards supply into VB nor VDD of the adapter MB4U is not permitted.

## BiSS MASTER IP MB100

The MB4U is based on the MB100 BiSS master IP. With this implementation it is possible to connect one or more BiSS devices or a single SSI device to the adapter. The BiSS C and BiSS B protocol is fully supported. The adapter supports the maximum directly addressable count of BiSS C slave devices: 8 slaves.

With high speed buffered transfer the real-time measured data can be block-wise transferred to a Windows PC application for analysis, documentation, data processing, etc.

With BiSS there is 10 MBit/s RS422 maximum clocking available. The SSI protocol is also configurable.

Too high frame repetition rates may exceed the capabilities of the used USB interface and the used PC. A limitation of frame repetition rates may be possible by system setup and details.

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## SENSOR SUPPLY THROUGH USB

The output voltage VDD and output current I(VDD) of the adapter do dramatically depend on the used PC, USB port and the used USB cable. On critical applications regarding sensor supply voltage and high sensors current consumption the shipped 1.8 m USB cable may cause a crucial voltage drop.

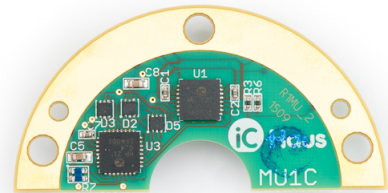
### **N.B.:**

On critical applications it is recommended to reduce the USB cable length.

On critical applications it is recommended to choose a high quality and high current capable USB cable.

## MU1C ADAPTER AND CABLE SET

The iC-MB4 iCSY MB4U-CABLE1 contains an additional extension cable to MU1C. This cable connects MU1C with the BiSS interface and does supply the MU1C board with VDD and GND. The extension cable ships typically with MU1C.



For more details please check:  
<http://www.ichaus.com/MU1C>

Figure 1: MU1C

### APPLICATION SOFTWARE

The BiSS reader software is a good and generic tool to access position and register data of BiSS devices. The BiSS reader software can be used on PCs with Windows operating systems, as well as the BiSS interface DLL and the required USB driver for available adapters. Installers for the BiSS reader software software, the BiSS Interface DLL and USB drivers for the adapters are available as a downloadable ZIP file.

Download from <http://www.ichaus.de/software>

For iC-Haus iC devices easy to use product specific evaluation software is also available and can be used to access, configure and calibrate. Installers for product specific evaluation software, the product specific DLLs and USB drivers for the adapters are available as a downloadable ZIP file.

Download from <http://www.ichaus.de/software>

Download from [http://www.ichaus.de/MB4U\\_driver](http://www.ichaus.de/MB4U_driver)

#### Installation

After unzipping the Driver ZIP, the driver executable file(s) are located in the selected directory.

**Note:** Administrator rights are required to run installation.

The BiSS software for PCs running on Windows operating systems is available as an installer. Download from [http://www.ichaus.de/BiSS\\_gui\\_rte](http://www.ichaus.de/BiSS_gui_rte)

See also the iC-Haus software overview <http://www.ichaus.de/software>

1. USB driver need to be installed to access the BiSS PC Adapter. Execute the executable in the driver installation package and follow the on-screen instructions. This process can take a few minutes.
2. The installation of the BiSS software starts by executing the installer. Follow the on-screen instructions to finish the installation procedure.
3. Installation will make the BiSS software available in the selected working directory. The execution of this file will start the software. Figure 2 shows a screenshot of the start up window.

#### Connection

Before connecting the BiSS adapter to the PC please make sure you have installed the latest USB driver!

Connect the adapter via the MINI USB cable and start the BiSS software executable. Select the interface operating mode to the dedicated adapter e.g. "iC-Interface ↔ USB(MB4U) Ctrl-4" for MB4U. The interface display should show "Connected" - the adapter is now ready to operate.



### Top Button and Check Box Description

Button	Description
Disconnected/Connected	Indicates and allocates/disallocates the adapter hardware
Read SCD	Reads in sensor data
Check Box	Description
Continuous	Reads in sensor data continuously and read data is displayed in the SCD content
Save	Saves sensor data to file with reading SCD data continuously

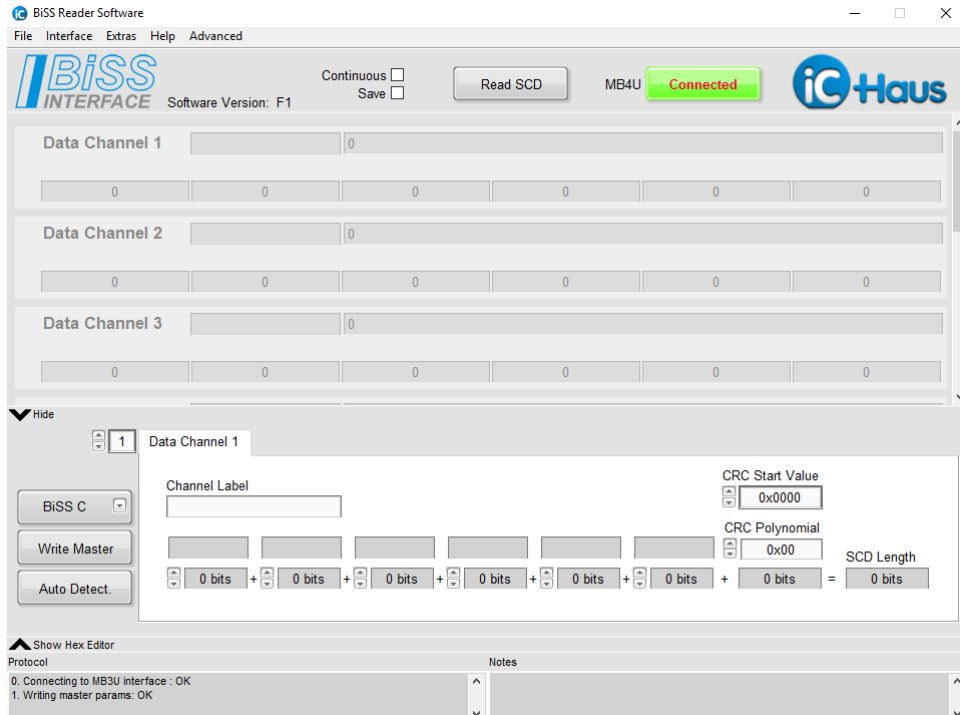


Figure 2: Start screen with connected adapter

### Configuration

To set the BiSS Master for the sensor(s) connected to it, select **Config Slaves** and manually configure the BiSS parameters (data lengths, CRC polynomials, etc.) according to the sensor's data sheet.

### Auto Detection of the Connected Device Configuration

BiSS permits different possibilities and detail levels for an automatic detection of the connected device configuration.

Implemented Auto Detection functions:

- Custom Auto Detection with selected XML file path
- Auto Detection via BiSS EDS
- Auto Detection via BiSS ID and standard BiSS XML file path
- Auto Detection via BiSS Profile ID

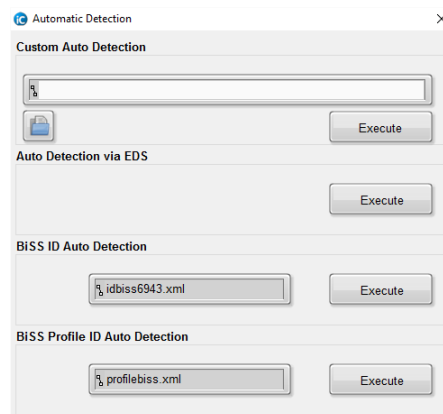


Figure 3: Automatic Detection

### BiSS XML Files

The file "idbiss6943.xml" is a BiSS device description file for BiSS slave iCs of iC-Haus. Further XML files are integrated with the date of the software release. For possible updates and new XML files please contact the manufacturer of your sensor for an appropriate device description file or set the transmission parameters yourself later. See also at the BiSS website in the identifier section for published XML files <http://www.biss-interface.com>.

### BiSS Reader Configuration Files

Transmission parameter settings can be stored to a \*.cfg file for later use with the BiSS software. Those configuration files can be imported by API(DLL) functions.

### Master Configuration Files

The "Save BiSS-Master-Config" writes an BiSS Master Chip configuration description into a \*.txt file (e. g. setup of MB100). Those BiSS master configuration files can be integrated into configuration code sets for programming BiSS master iC's or iP's to a dedicated BiSS setup.

### BiSS Reader Software Menu Items Description of Menu Section

<File>	Save Config File Load Config File Save Master Config Exit	Writes BiSS transmission parameter settings to file Loads BiSS transmission parameter settings from file Writes an interface configuration description to file Quit software
<Interface>	No Hardware iC-Interface ↔ USB(MB3U) Ctrl-U iC-Interface ↔ USB(MB4U) Ctrl-4 iC-Interface ↔ USB(MB5U) Ctrl-5	Switch to no hardware to deallocate an adapter For use with BiSS PC-USB adapter MB3U and MB3U-I2C For use with BiSS PC-USB adapter MB4U For use with BiSS PC-USB adapter MB5U
<Extras>	Generate Report  Reset User Preferences	Exports software screens, log book text and configuration into a single ZIP file for support purpose  Reset all user preferences of the BiSS software
<Help>	BiSS homepage BiSS datasheet	Opens the link <a href="http://www.BiSS-Interface.com">www.BiSS-Interface.com</a> in Your browser Opens the BiSS protocol description link in Your browser
<Advanced>	Fast Reader  EDS Editor Math Analysis Initializes the BiSS bus communication	Opens the Fast Reader sub window, only for use with BiSS PC-USB adapter MB4U or MB5U  Opens the BiSS EDS viewer and editor sub window Opens the BiSS math analysis sub window Initializes the BiSS Interface channel

### SCD Configuration Button and Selector Button Description

Write Master	Transfers configuration updates to the allocated adapter
Auto Detect.	Automatic detection and identification of connected BiSS sensor(s) SCD configuration
BiSS C/B/SSI	Selects the required protocol

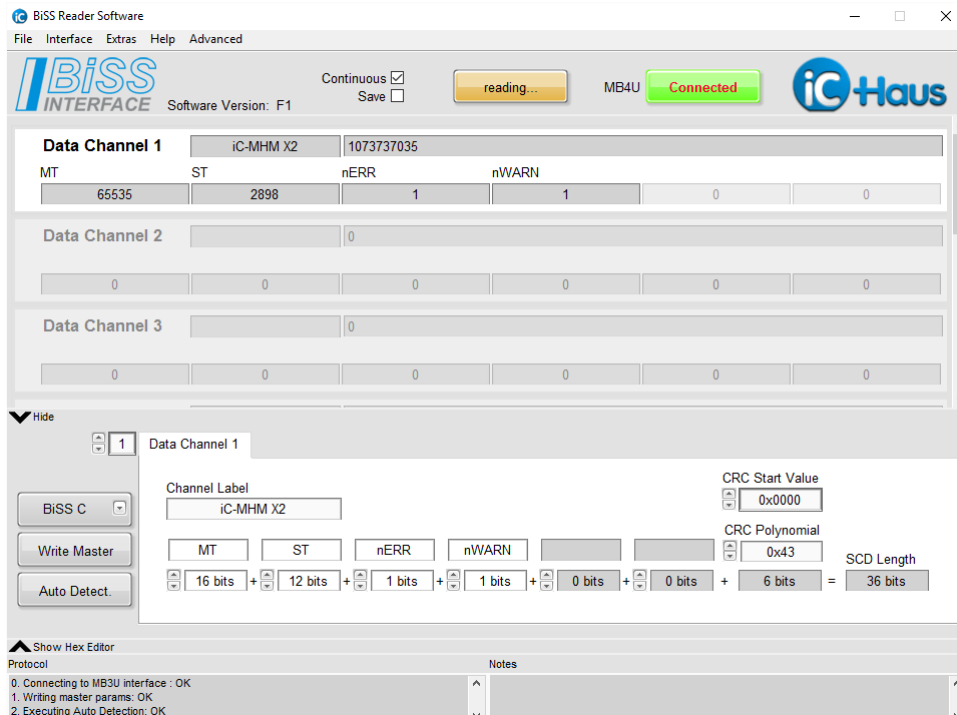


Figure 4: Single Cycle Data Screen

### Hex Editor Button and Selector Button Description

Area Select	Reads in sensor data
Read Register	Transfers configuration updates from the selected slave ID
Write Register	Transfers configuration updates to the selected slave ID
Save Reg. File	Saves sensor data to PC file
Load Reg. File	Loads sensor data from PC file
Fill	Fills all registers in the selected area with selected content or symbol
CRC Calculation	Calculates the CRC of a dedicated area

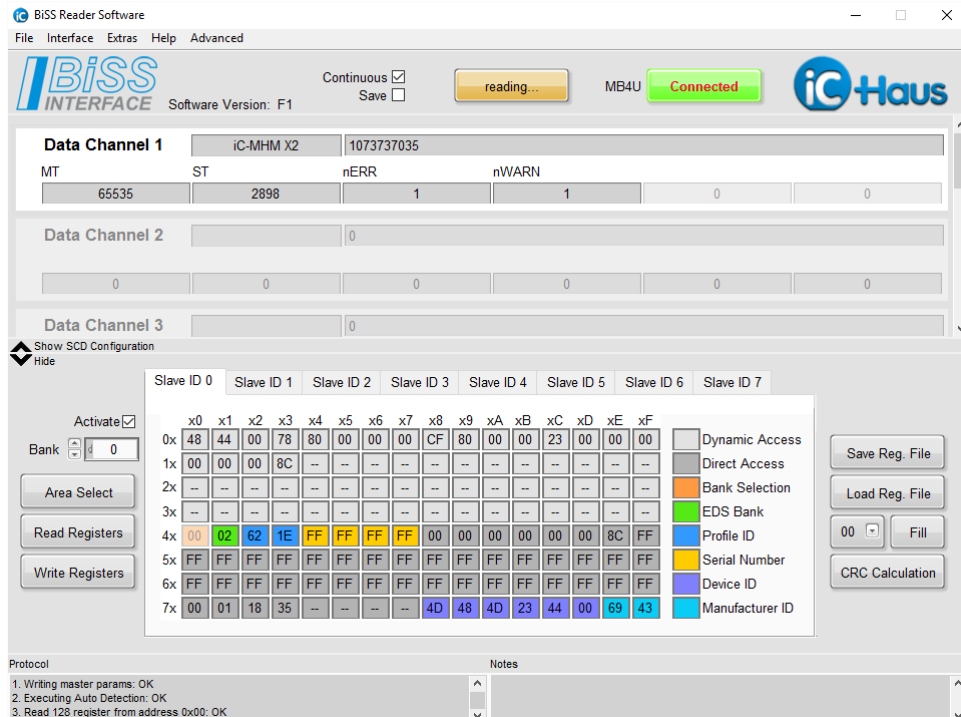


Figure 5: Register Access Screen (one tab each per slave ID)

### Possible Errors

Main causes for errors:

- Using more than one software.
  - Please make sure that only one software is accessing the BiSS adapter at the same time.
- Insufficient power supply for all sensors attached.
  - The adapter will not respond if there is an overload due to the sensor(s) connected.
  - Please check wiring and use external power supply.
- Invalid transmission parameter settings.
  - Please check the sensor specific BiSS slave parameters, such as CRC polynomial etc.
  - Please check wiring and use external power supply.
- Invalid wiring
  - Please check wiring and use external power supply.

**EU DECLARATION OF CONFORMITY**

EU Konformitätserklärung  
EU Declaration of Conformity

- |    |  |  |
|----|--|--|
| 1. | Gerätetyp/Produkt<br><i>Apparatus model/Product</i>  | Adapter USB 2.0 <-> BiSS   |
| 2. | Name und Anschrift des Herstellers<br><i>Name and address of the manufacturer</i>  | Gottinger Instruments GmbH<br>Ilzleite 34, 94034 Passau, Germany |
| 3. | Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt der Hersteller. <i>This declaration of conformity is issued under the sole responsibility of the manufacturer.</i>  |  |
| 4. | Gegenstand der Erklärung<br><i>Object of the declaration</i>   | MB4U   |
| 5. | Der oben beschriebene Gegenstand der Erklärung erfüllt die einschlägigen Harmonisierungsrechtsvorschriften der Union. <i>The object of the declaration described above is in conformity with the relevant Union harmonisation legislation.</i>   |  |
|    | <p>RICHTLINIE 2014/30/EU DES EUROPÄISCHEN PARLAMENTS UND DES RATES vom 26. Februar 2014 zur Harmonisierung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit</p> <p><i>DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility</i></p>   |  |
| 6. | <p>Angabe der einschlägigen harmonisierten Normen, die zugrunde gelegt wurden, einschließlich des Datums der Norm, oder Angabe anderer technischer Spezifikationen, für die die Konformität erklärt wird, einschließlich des Datums der Spezifikation:<br/><i>References to the relevant harmonised standards used, including the date of the standard, or references to the other technical specifications, including the date of the specification, in relation to which conformity is declared:</i></p> <p><i>DIN EN 55022; VDE 0878-22:2011-12 - Einrichtungen der Informationstechnik - Funkstöreigenschaften - Grenzwerte und Messverfahren (CISPR 22:2008, modifiziert); Deutsche Fassung EN 55022:2010</i></p> <p><i>DIN EN 55024; VDE 0878-24:2016-05 - Einrichtungen der Informationstechnik - Störfestigkeitseigenschaften - Grenzwerte und Prüfverfahren (CISPR 24:2010 + Cor.:2011 + A1:2015); Deutsche Fassung EN 55024:2010 + A1:2015</i></p> |  |
| 7. | Nicht zutreffend.<br><i>No applicable.</i>   |  |
| 8. | Zusatzangaben<br><i>Additional information</i>   | --   |

Unterschiedet für und im Namen von:  
*Signed for and on behalf of:*

Gottinger Instruments GmbH

Ort und Datum der Ausstellung:  
*place and date of issue*

Passau, 25. April 2016

Name und Funktion  
*name, function*

Reinhard Gottinger, Geschäftsführer  
*Reinhard Gottinger, Managing Director*

Figure 6: EU Declaration of Conformity

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### REVISION HISTORY

Rel.	Rel. Date*	Chapter	Modification	Page
A1	2010-06-09	ATTACHMENTS	First official release.	all
A2	2010-07-29	ORDERING INFORMATION	Order codes added.	6
A3	2010-08-09	ORDERING INFORMATION	Software links removed.	4
B1	2010-10-11	FEATURES	BiSS C, BiSS C unidirectional, SSI updated.	1
B2	2011-05-12	BISS POWER SUPPLY CONTROL	Power control hint added.	4
B3	2013-03-04	DESCRIPTION	BUA info added.	2
		BISS SOFTWARE ENVIRONMENT	BiSS DLL 5.2 supports multiple MB4U adapter in one application.	4
B4	2013-10-28	BISS POWER SUPPLY CONTROL	Power control hint added.	4
		BISS POWER SUPPLY CONTROL	Galvanic coupling info added.	4
B5	2013-11-22	CONNECTORS	MU1C related 6 pin cable connector added.	3
		MU1C ADAPTER AND CABLE SET	MU1C chapter added.	6
		ORDERING INFORMATION	Order code iC-MB4 iCSY MB4U-CABLE1 added.	7
C1	2017-03-09	SYSTEM VIEW	MB4U SYSTEM VIEW picture updated.	1
		DESCRIPTION	Supported OS list updated: Windows 10, 32 and 64 bit drivers added.	2
		ABSOLUTE MAXIMUM RATINGS	ABSOLUTE MAXIMUM RATINGS updated, partial transfer into ELECTRICAL CHARACTERISTICS.	4
		ABSOLUTE MAXIMUM RATINGS	ABSOLUTE MAXIMUM RATINGS non relevant content removed.	4
		ELECTRICAL CHARACTERISTICS	ELECTRICAL CHARACTERISTICS added.	5
		DESCRIPTION	LPT driver no more relevant and removed.	6
		GALVANIC COUPLING OF USB, POWER SUPPLY, GND, SIGNALS AND SHIELD	Chapter updated.	6
		BISS POWER SUPPLY CONTROL	Chapter updated.	6
		BISS MASTER IP MB100	Chapter updated.	6
		CONNECTORS	"The extension cable ships typically with MU1C." added.	7
		ELECTRICAL CHARACTERISTICS	"Interface Power Supply" standardized to VB and VDD Supply Output	7
		SENSOR SUPPLY THROUGH USB	Chapter SENSOR SUPPLY THROUGH USB added.	7
		MU1C ADAPTER AND CABLE SET	MU1C chapter updated.	7
		APPLICATION SOFTWARE	Chapter replaces BiSS SOFTWARE ENVIRONMENT.	8
		EU DECLARATION OF CONFORMITY	Chapter added.	13
		REVISION HISTORY	REVISION HISTORY updated to standard format.	14

\* Release Date format: YYYY-MM-DD

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## ORDERING INFORMATION

Type	Package	Order Designation
MB4U	105 mm x 33 mm x 16 mm Aluminium blue anodized	iC-MB4 iCSY MB4U
MB4U-CABLE1	105 mm x 33 mm x 16 mm Aluminium blue anodized, including 500 mm MU1C cable	iC-MB4 iCSY MB4U-CABLE1

Please send your purchase orders to our order handling team:

**Fax: +49 (0) 61 35 - 92 92 - 692**

**E-Mail: [dispo@ichaus.com](mailto:dispo@ichaus.com)**

For technical support, information about prices and terms of delivery please contact:

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**Am Kuemmerling 18**  
**D-55294 Bodenheim**  
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